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TITLE: Mental Health Disorders, Suicide Risk, and Treatment seeking among Formerly Deployed National Guard and Reserve Service Member seen in Non-VA Facilities

PRINCIPAL INVESTIGATOR: Joseph A. Boscarino, PhD, MPH

CONTRACTING ORGANIZATION: Geisinger Clinic
Danville, PA 17822

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14. ABSTRACT The focus of the current study was to assess the prevalence of and risk factors for mental health disorders and variations in service use among National Guard and Reserve service members seen in non-VA facilities following deployments, compared to other era service members. Of the 1,730 veterans surveyed, 95% were male, 44% were under 64 years old, 96% were white race, 40% reported multiple warzone deployments, and 38% (n=665) had served as National Guard/Reserve service members. In addition, 23% (n=396) serviced in Iraq, Afghanistan, or the Global War on Terrorism. The prevalence of current PTSD was 5.4% (probable PTSD = 7.6%), current depression was 8%, 23% had used mental health services in the past year, and 50% had used the VA in the past year. The most common current disorder was related to alcohol misuse, with 24% of veterans screening positive on the AUDIT-C scale. In addition, 28% reported a history of concussion during their military service. Analyses indicated that PTSD, depression, mental health service use, alcohol misuse, suicidality, and stressful life events were more common among National Guard/Reserve veterans, compared to other era veterans (p-values < 0.05). However, other era veterans were more likely to rate themselves in "fair" or "poor" health and to report a service-connected disability (p-values < 0.05). Nevertheless, multivariable analyses that adjusted for demographic differences, level of combat exposure, current life stressors, and current social support, found no differences in mental health status and mental health service use among the veteran groups. To date, analyses suggest that while deployed National Guard/Reserve service members tended to have a higher prevalence of mental health disorders and mental health service use, when the data were adjusted for demographic difference and potential confounders, there were few differences in outcomes between these groups.					
15. SUBJECT TERMS PTSD, Depression, Service Use, Suicidality, Alcohol Misuse, Concussion, Deployment, VA Service Use, National Guard/Reserve					
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▪ **INTRODUCTION:**

The focus of the current study is to assess the prevalence of and risk factors for mental health disorders, variations in service use, and outcomes among National Guard and Reserve service members following warzone deployments. This study is important because most veterans have private and/or other health insurance coverage and often receive their care from non-VA institutions. The knowledge gained from studying National Guard and Reserve veterans in non-VA healthcare systems is highly relevant. The availability of healthcare options for veterans has increased in recent years through changes in VA policy and insurance coverage options. Today most veterans are not seen in VA facilities, but in non-VA healthcare systems. The Geisinger Clinic, the community partner for the current study, is the largest, non-profit integrated healthcare organization located in central and northeastern Pennsylvania. This system serves more than 3 million residents throughout more than 44 counties in Pennsylvania. Geisinger has more than 30,000 employees, including a 1,600-member multi-specialty group practice, ten hospital campuses, a 551,000-member health plan, and a medical school (Geisinger Commonwealth Medical School), and is one of the largest employers in the state (see: www.geisinger.org). The knowledge gained from studying veterans in non-VA healthcare systems is important for the monitoring the quality of care, diagnostic screening, and for outcomes research. Currently, Geisinger has over 50,000 current and former service members who use this system for their healthcare. Many of these patients currently are or were former members of the National Guard or the Reserves.

▪ **KEYWORDS:**

Mental Health Disorders, Service Use, Substance Misuse, Deployment, Treatment Outcomes, Traumatic Brain Injury, Concussion, National Guard, Reserves.

▪ **ACCOMPLISHMENTS:**

- **What were the major goals of the project?**

YEAR 1

Major Goal 1: Study Start, Instrument/Protocol Finalization, Local IRB, DoD IRB Approval

Subtask 1: Convene initial study meetings with study group (+1 month)

Subtask 2: Review and update study instruments and protocol from pilot study, pilot test revised protocol (+1/2 months)

Subtask 3: Submit revised protocol to Geisinger's IRB and obtain approval (+2 months)

Subtask 4: Submit protocol for DoD's IRB review (+3 months)

Milestone: Finalize study protocol/instruments received required IRB approvals (+3/4 months)

Major Goal 2: Survey Data Collection, Baseline EHR Data Collection, DNA Collection, Data Cleaning, Preliminary Data Analyses

Subtask 1: Pull baseline electronic health record (EHR) data from Geisinger's Information Technology (IT) Systems, including veteran status data, outpatient, inpatient, emergency department, and laboratory data

Subtask 2: Conduct survey data collection

Subtask 3: Collect DNA Samples by Mail

Subtask 4: Conduct preliminary data analyses

Milestones Achieved: Survey data collected, baseline EHR data collected, DNA collected, preliminary analyses being completed

YEAR 2

Major Goal 3: Bio-bank DNA, Complete Genotyping, Merge Survey, EHR, and Genotype Data, Complete Analyses for Study Aim 1 (Prevalence Study) and for Aim 2 (PTSD Study), Prepare Manuscripts for Review

Subtask 1: Complete genotyping of selected study SNPs

Subtask 2: Merge genotype data into survey and EHR datasets

Subtask 3: Continue analyses related to study Aims 1 and 2

Subtask 4: Convene study team conference to review study results

Subtask 4: Prepare and submit posters/manuscripts for peer review

Subtask 5: Complete and review preliminary genetic analyses

Subtask 6: Prepare additional posters/manuscripts for internal review and peer review submission

Milestones Achieved: DNA Bio-banked, complete genotyping, merge survey, EHR, and genotype data, complete additional analyses for study Aims 1 and 2, prepared & submit year 2 posters/manuscripts for peer review

YEAR 3

Major Goal 4: Complete Follow-up EHR data pull from Geisinger IT Systems, Merge Follow-up Data, Complete Analyses for Study Aim 3 (Effectiveness) and for Aim 4 (Genetics), Prepare Final Manuscripts for Review and Submission, Convene Final Conferences and meetings

Subtask 1: Conduct Follow-up data pull from Geisinger's EHR Systems, using outpatient, inpatient, emergency department and laboratory data

Subtask 2: Merge and clean/code data/ and run preliminary analyses

Subtask 3: Complete analyses for Aims 3 and 4

Subtask 4: Prepare final manuscripts for review and submission

Subtask 5: Prepare and submit proposals for additional genetic and follow-up research funding

Subtask 6: Prepare documentation/datasets for bio-banking and data-sharing of study data

Subtask 6: Complete follow-up EHR data pull from Geisinger EHR/IT Systems, merge follow-up data, completed analyses for Aims 3 and 4, Prepare Final manuscripts for review and submission, convene final conference meeting, prepare documentation and datasets for data sharing.

Yearly Patient Enrollment

Table 1. (planned)	Year 1*			
Target Survey Enrollment (per quarter)	Q1	Q2	Q3	Q4
Geisinger Site	1500	200	100	0
Target/Planned Enrollment (cumulative)	1500	1700	1800	1800

***Due to recruitment difficulties, only 1,289 veterans were recruited in Year 1.**

- **What was accomplished under these goals?**

YEAR 2

Major Goal 3:

Quarter 1-

Received 718 saliva samples, isolated 600 DNA and completed 22 SNP on over 500 samples. The study team worked on drafting several manuscripts for the data received. Presented poster entitled "Mental Health Disorders and Treatment seeking among Formerly Deployed National Guard and Reserve Service Members" at the Annual Meeting of the Society of Federal Health Professionals Annual Meeting on November 29, 2016 in National Harbor, MD. Several other posters were prepared for presentation in the coming months.

Quarter 2-

Received 1,005 saliva samples, isolated 950 DNA samples, and genotyped 752 DNA samples using 28 SNP assays. Began to merge available DNA results with survey data and started to analyze the results. Prepared for Town Hall meeting with patients who participated in the study. The purpose of the meeting was to present preliminary results to veterans and receive their feedback to help guide study analyses. An oral presentation was given by Dr. Adams at the Military Sociology Session of the 2017 Eastern Sociological Society Annual Meeting in Philadelphia, PA, on February 23rd. The presentation was entitled "Social support and coping resources, mental health problems, and treatment seeking among veterans in non-VA facilities: Results from the Veterans' Health Study." An abstract was submitted by Dr. Urosevich to the Annual Meeting of the American Optometric Association entitled "Concussive effects (mTBI) in veterans from the Iraq and Afghanistan conflict era in relation to other physical and

psychological health problems." Two posters were presented at the Health Care Systems Research (HCSRN) conference in San Diego, CA on March 21st, 2017. The posters were entitled "Alcohol Misuse among Formerly Deployed U.S. Service Members seen Non-VA Facilities: Results from the Veterans' Cohort Study" (Dr. Boscarino) and "Post-Deployment Mental Health Status and Obesity among a Multi-Generational Sample of U.S. Veterans" (Ms. Hyacinthe). Finally due to recruitment difficulties, only 1,730 total veterans were recruited by end of Q2 in Year 2, after which study recruitment was stopped.

Quarter 3-

Received 1,116 saliva samples, isolated 1,110 DNA samples and genotyped 920 DNA samples using 30 SNP assays. Continued to merge available DNA results with survey data and started to analyze these results. This allowed for the preparation and review of the planned manuscripts by the study team. The study team also held a "Town Meeting" on May 20th, 2017 at Geisinger's Henry Hood Center in Danville, PA with 85-90 patients who participated in the survey study. Preliminary study results were presented to the veterans and the study team administered an anonymous survey to obtain veterans' feedback to guide future study analyses. A poster submitted by Dr. Urosevich was accepted for the Annual Meeting of the American Optometric Association. The poster is entitled " Concussive Effects (mTBI) in Veterans from the Iraq and Afghanistan Conflict Era in Relation to Other Physical and Psychological Health Problems," which was chosen as one of the top 5 posters submitted to the conference. In addition, a brief (IRB approved) telephone survey was administered to 265 Iraq and Afghanistan veterans included in main baseline survey, to provide additional TBI data on this key study population. These data are being analyzed by the study team and a research paper is currently being prepared.

Yearly Patient Enrollment

Table 1. (actual)	Year 2*			
Target Survey Enrollment (per quarter)	Q1	Q2	Q3	Q4
Target Enrollment (cumulative)	1600	1800	1800	1800

***Due to recruitment difficulties, only 1,730 total veterans were recruited by end of Q2 in Year 2, after which recruitment was stopped.**

- **What opportunities for training and professional development has the project provided?**
Junior staff members and students were able to participate in poster presentations and manuscript preparations. A total of 8 posters were submitted and 3 manuscripts from the pilot study were submitted for peer review. A graduate student volunteer (Joseph J. Boscarino) is also assisting with manuscript preparation.
- **How were the results disseminated to communities of interest?**
The study team held a "Town Hall" meeting on May 20th, 2017 at Geisinger's Henry Hood Center in Danville, PA with patients who participated in the study. The purpose of this meeting was to present preliminary results to veterans and received their feedback. A Veterans' Health Study website was also established. (See: <https://www.geisinger.edu/en/research/research-and-innovation/find-an-investigator/2017/04/03/13/38/joe-boscarino>)
A total of 8 posters were submitted and 3 manuscripts from pilot study were submitted for peer review. Several media interviews were also given by the study PI with local newspaper and radio stations.
- **What do you plan to do during the next reporting period to accomplish the goals?**
Our primary goal is to complete data collection and data analyses and submit final manuscripts for peer review and publication. We also plan to convene one final Town-Hall meeting with local veterans, if resources permit.

4. IMPACT:

- **What was the impact on the development of the principal discipline(s) of the project?**
Nothing to Report.
- **What was the impact on other disciplines?**
Nothing to Report.
- **What was the impact on technology transfer?**

Nothing to Report.

- **What was the impact on society beyond science and technology?**

Through a local town-hall meeting held in May 2017, at Geisinger's Center for Health Research in Danville, PA, Veterans within Geisinger's service area were made aware of the study, as were the offices of Pennsylvania's Department of Veterans Affairs and local VA services representatives. Media coverage related to the study was also disseminated in the local and regional press.

5. CHANGES/PROBLEMS: There were no substantive study changes during Year 2. However, the main problem faced related recruitment of Guard/Reserve service members, as noted

- **Changes in approach and reasons for change:**
With Geisinger IRB approval, we posted Guard/Reserve recruitment notifications on the Geisinger Portal and contacted local veterans' service representatives at local colleges in order to identify additional Guard/Reserve service members. These efforts resulted in the identification of several hundred additional Guard/Reserve service members.
- **Actual or anticipated problems or delays and actions or plans to resolve them.**
The difficulty in the recruitment of Guard/Reserve service members has delayed our data analyses. We plan to add additional data analysis staff and to perhaps request a no cost extension for this research contract.
- **Changes that had a significant impact on expenditures**
Due to data collection delays, our budget is under spent at this time.
- **Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents:**
Nothing to Report
- **Significant changes in use or care of human subjects:**
Nothing to Report
- **Significant changes in use or care of vertebrate animals:**
Nothing to Report
- **Significant changes in use of biohazards and/or select agents:**
Nothing to Report

6. PRODUCTS:

- **Publications, conference papers, and presentations**
Journal publications.
Nothing to Report
- **Books or other non-periodical, one-time publications.**
Nothing to Report
- **Other publications, conference papers, and presentations.**

Presented poster entitled "Mental Health Disorders and Treatment seeking among Formerly Deployed National Guard and Reserve Service Members" presented by Dr. Boscarino at the annual Meeting of the Society of Federal Health Professionals Annual Meeting, National Harbor, MD on November 29, 2016.

Presented poster entitled "Alcohol Misuse among Formerly Deployed U.S. Service Members seen Non-VA Facilities: Results from the Veterans' Cohort Study" presented by Dr. Boscarino at the Health Care Systems Research conference in San Diego, CA on March 21st 2017.

Presented poster entitled "Post-Deployment Mental Health Status and Obesity among a Multi-Generational Sample of U.S. Veterans" by Ms. Hyacinthe at the Health Care Systems Research conference in San Diego, CA on March 21st 2017.

Presented poster entitled "Is Living in Rural Areas a Risk Factor for Veteran's Mental Health Status?" by Dr. Figley was presented at the 2017 American Psychological Association Annual Convention in Washington, D.C. on August 3rd 2017.

A poster presented by Dr. Urosevich was presented at the Annual Meeting of the American Optometric Association in Washington DC in June 2017. The poster was entitled "Concussive Effects (mTBI) in Veterans from the Iraq and Afghanistan Conflict Era in Relation to Other Physical and Psychological Health Problems," which was chosen as one of the top 5 posters submitted to the conference.

A poster will be presented by Dr. Figley entitled, "Female Military Veterans' Risk and Protective Factors in Predicting Overall Functioning: A Biomedical Sample of Outpatients from Geisinger Clinic," at the International Society for Traumatic Stress Studies, Chicago, November 9, 2017.

A poster will be presented by Dr. Boscarino entitled, "Risk and Protective Factors for Suicide among Formerly Deployed U.S. Service Members: Results from the Veterans' Health Study," at the International Society for Traumatic Stress Studies, Chicago, November 9, 2017.

A poster will be presented by Dr. Boscarino entitled, "Mental Health Impact of Homecoming Experience among Deployed Veterans from the Vietnam War to Current Warzone Conflicts: Results from the Veterans' Health Study," at the International Society for Traumatic Stress Studies, Chicago, November 10, 2017

▪ **Journal publications (in-direct products from pilot study)**

Adams, R; Urosevich, T; Hoffman, S; Kirchner, H.L; Hyacinthe, J; Figley, C; Boscarino, J.J; Boscarino, J.A. Social Support, Coping Resources, Mental Health Problems, and Treatment Seeking among Veterans in Non-VA Facilities: Results from the Veteran's Health Study. *Military Behavioral Health* 5 (4) 2017 doi: org/10.1080/21635781.2017.1333067n (in-press).

Lent, M; Hoffman, S; Kirchner, H.L; Urosevich, T; Boscarino, J.J; Boscarino, J.A. Attitudes about Future Genetic Testing for Posttraumatic Stress Disorder and Addiction and among Community-based Veterans. *Frontiers in Psychiatry: Behavioral and Psychiatry Genetics* May 15; 8:76. doi: 10.3389/fpsy.2017.00076. eCollection 2017.

▪ **Website(s) or other Internet site(s)**

- A website was established to disseminate study findings:

<https://www.geisinger.edu/en/research/research-and-innovation/find-an-investigator/2017/04/03/13/38/joe-boscarino>

▪ **Technologies or techniques**

Nothing to Report

▪ **Inventions, patent applications, and/or licenses**

Nothing to Report

▪ **Other Products**

See in-direct product publications from pilot study listed above.

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

▪ **What individuals have worked on the project?**

Name:	Joseph A. Boscarino
Project Role:	<i>Principle Investigator, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	24
Contribution to Project:	<i>Wrote study application, secured study funding, directed overall study execution, monitored study progress and budget, prepared and reviews study presentations and manuscripts for dissemination. Traveled to regional/national professional meetings to present study results.</i>
Name:	Charles Figley
Project Role:	<i>Co-Investigator, Tulane University</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	23

Contribution to Project:	Participated in conference calls and personal meetings with PI to discuss study measurements, data analysis, conceptual focus, coordination of IRB approval with Tulane University's IRB, and review of data collection instruments for current study. Prepared and reviews draft manuscripts and presentations related to study. <i>Traveled to regional/national professional meetings to present study results.</i>
Name:	Richard Adams
Project Role:	<i>Co-Investigator, Kent State University</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	23
Contribution to Project:	Participated in conference calls and personal meetings with Study PI to discuss planned study measurements, data analysis, conceptual focus of study, coordination of IRB approval with Kent State's IRB, and review of data collection instruments planned for current study. Prepared and reviewed draft manuscripts and presentations related to study findings. <i>Traveled to regional/national professional meetings to present study results.</i>
Name:	Thomas Urosevich
Project Role:	<i>Co-Investigator, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	23
Contribution to Project:	Participated in conference calls and personal meetings with PI to discuss planned study measurements, data analysis, conceptual focus of study, identification of phenotypes for study, and identification of key TBI measures to be used in study. Prepared and reviewed draft manuscripts and presentations related to study findings. <i>Traveled to regional/national professional meetings to present study results.</i>
Name:	Stuart Hoffman
Project Role:	<i>Co-Investigator/Neuroscience Consultant</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	23
Contribution to Project:	Participated in conference calls and personal meetings with PI to discuss planned study measurements, data analysis, conceptual focus of study, identification of key genotypes for study, and identification of key neurological and sleep disturbance measures to be used in study. Prepared and reviewed draft manuscripts and presentations related to study findings.
Name:	H. Lester Kirchner
Project Role:	<i>Co-Investigator, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	23
Contribution to Project:	Contribution to Project: Consulted with Study PI regarding biostatistics, study database, and data dictionary planned for study, and met with his study staff assigned to the project. Prepared and reviewed draft manuscripts and presentations related to study findings.
Name:	Xin Chu
Project Role:	<i>Genetic Consultant, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A

Nearest person month worked:	22
Contribution to Project:	Ordered Inventory of needed supplies and assays for study and oversaw the genotyping and bio-banking of DNA being collected for study. Reviewed draft manuscripts and presentations related to study findings.
Name:	Carrie Withey
Project Role:	<i>Project Manager, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	3
Contribution to Project:	DoD Report and document preparation, regulatory compliance, budgeting, and operational management of study. Prepared and reviewed draft manuscripts and presentations related to study findings.
Name:	Johanna Hyacinthe
Project Role:	<i>Former Project Manager, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	18
Contribution to Project:	Application and document preparation, regulatory compliance, budgeting, and operational management of study. Prepares and reviews draft manuscripts and presentations related to study findings. Traveled to regional/national professional meetings to present study results.
Name:	James Pitcavage
Project Role:	<i>Former Project Manager, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID):	N/A
Nearest person month worked:	3
Contribution to Project:	Completed study IRB application and document preparation, regulatory compliance, budgeting, and operational management of study.
Name:	Eric Snover
Project Role:	<i>Former Research Assistant, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	6
Contribution to Project:	Conducted study mailings, mailed and tracked study incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation. Assisted with the daily operations of study.
Name:	Brielle Evans
Project Role:	<i>Former Research Assistant, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	4
Contribution to Project:	Mailed incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation. Assisted with the daily operations of study.
Name:	Melinda Hatt
Project Role:	<i>Former Research Assistant, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A

Nearest person month worked:	4
Contribution to Project:	Mailed incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation. Assisted with the daily operations of study.
Name:	Jared Pajovich
Project Role:	<i>Former Research Assistant, Geisinger Clinic</i>
Researcher Identifier (e.g. ORCID ID)	N/A
Nearest person month worked:	11
Contribution to Project:	Completed Certificate of Confidentiality application, mailed incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation. Assisted with the daily operations of study.

- **Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?**

Nothing to Report

- **What other organizations were involved as partners?**

Nothing to Report

8. SPECIAL REPORTING REQUIREMENTS

- **QUAD CHART:** *Submitted as an attachment*

9. APPENDICES

- **Research Products:** *Submitted as attachment*

Mental Health Disorders and Treatment seeking among Formerly Deployed National Guard and Reserve Service Members

Joseph A. Boscarino, PhD, MPH;¹ Stuart N Hoffman, DO;¹ Thomas G. Urosevich, OD, MS, FAAO;¹ H. Lester Kirchner, PhD;¹ Johanna C. Hyacinthe, MS;¹ Jared V. Pajovich, BA;¹ Richard E. Adams, PhD;² Charles R. Figley, PhD³
¹Geisinger Clinic, ²Kent State University, ³Tulane University

Presented at: The AMSUS 2016 Federal Health Conference, Gaylord National Convention Center, National Harbor, MD, November, 29 to December 2, 2016.

Study Objective: Our objective was to assess the prevalence of mental health disorders and treatment seeking among deployed National Guard and Reserve service members seen in non-VA Facilities.

Methods: We surveyed a random sample of veterans who were patients in a large non-VA hospital system located in Central and Northeastern Pennsylvania to assess their mental health status and service use. The study included veterans from three cohorts: Vietnam, Gulf War, and Global War on Terror (GWOT) veterans. Our hypothesis was that deployed National Guard and Reserve GWOT veterans would have a higher prevalence of mental disorders, substance misuse, and mental health treatment seeking than deployed veterans from other eras.

Results: Of the 731 veterans surveyed, 39.9% were GWOT National Guard and Reserve veterans, 6.8% were female, 64% were under 64 years old, 75.7% were married, 95.7% were white, and 45% reported multiple warzone deployments. Overall, 26.7% of veterans had a mental health visit in the past year, 23.5% reported using psychiatric drugs, and 48.7% used the VA system in the past year. Current mental health disorders among veterans included alcohol misuse (14.6%), depression (10.1%), generalized anxiety (11.4%), and PTSD (10.4%). Altogether, 29% of veterans reported a concussion during military service and 42.7% reported current difficulty sleeping. Bivariate analyses indicated that current depression, mental health service use, alcohol misuse, generalized anxiety, and recent stressful life events were more prevalent among National Guard and Reserve GWOT veterans, compared to other era veterans (p-values < 0.05). However, other era veterans were more likely to report "fair" or "poor" health status and to report a service-connected disability (p-values < 0.05). Nevertheless, multivariable analyses that adjusted for age, gender, education, combat exposure, current life stressors and current social support, found no significant differences in mental health status or service use between these veterans.

Conclusion: Our analyses suggested that while deployed National Guard and Reserve GWOT service members tended to have a higher prevalence of mental health disorders and service use than other veterans, when the data were adjusted for demographic factors and potential confounders, there were no significant differences found between these veteran groups.

Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND (USAMRMC), PRINCIPAL INVESTIGATOR: Joseph A. Boscarino, PhD, MPH, Psychological Health and Traumatic Brain Injury Research Program (PHTBIRP) - Community Partners in Mental Health Research, Award # W81XWH-15-1-0506.

Learning Objectives:

Attendees will learn the prevalence of mental health disorder among service members seen in non-VA facilities.

Attendees will be able to describe the mental health disorders among service members seen in non-VA facilities.

Attendees will be able to identify risk factors for mental health disorders among service members seen in non-VA facilities.

Is living in Rural Areas a Risk Factor for Veterans' Mental Health Status?

Charles R. Figley PhD;¹ Joseph A. Boscarino, PhD, MPH;² Stuart N Hoffman, DO;² Thomas G. Urosevich, OD, MS;² H. Lester Kirchner, PhD;² Johanna C. Hyacinthe, MS;² Richard E. Adams, PhD;³

¹Tulane University, ²Geisinger Clinic, ³Kent State University

Presented at American Psychological Association Convention, Washington, D.C., August, 2017.

Study Objective: Given recent conflicting reports on rural residence being a risk factor for mental health disorders among formerly deployed service members, we studied those receiving service at Non-VA Facilities and who were residing in rural areas to determine if this was associated with poorer health outcomes.

Methods: We surveyed a random sample of 1,730 veterans who were outpatients in the largest non-VA multi-hospital system located in Central and Northeastern Pennsylvania to assess their mental health status, substance use, and treatment seeking. The study sample included veterans from four cohorts: Vietnam, Gulf War, Global War on Terror, and other veterans. We used 2015 US Census estimates to determine the rural status of the veteran's residential location. Those residing in areas > 95% rural were classified as rural residents. Our main hypothesis was that veterans from rural locations would have a higher prevalence of mental disorders and alcohol misuse than deployed veterans from non-rural locations.

Results: Of veterans surveyed, 44% lived in rural areas, 56% were from the Vietnam era, 95% were male, 56% were 65 years old or older, 78% were married, 96% were white race, and 23% were National Guard or Reserve veterans. Bivariate analyses suggested that older, white, married, non-college graduates, non-users of mental health services, non-users of psychotropic medicines, those without alcohol dependence, those less impaired on the BSI-18 global severity index, those without sleep disorders, and those with lower current life stressors, were more likely to reside in rural areas. Multivariate analyses adjusting for age, gender, education, marital status, income, Guard/Reserve status, multiple deployments, combat exposure level, current pain, concussion history, and current life stressor confirmed the bivariate results.

Conclusion: Despite reports that rural residence is a risk factor for medical and mental health problems among formerly deployed US veterans, our analyses failed to replicate these findings. Further research that examines the role of rural living among military veteran in determining their quality of life in general and their mental health in particular is ongoing.

Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND (USAMRMC), PRINCIPAL INVESTIGATOR: Joseph A. Boscarino, PhD, MPH, Psychological Health and Traumatic Brain Injury Research Program (PHTBIRP) - Community Partners in Mental Health Research, Award # W81XWH-15-1-0506.

Figley, C. R., Boscarino, J. A., Hoffman, S. N., Urosevich, T. G., Kirchner, H. L., Hyacinthe M. S. (2017). Is living in Rural Areas a Risk Factor for Veterans' Mental Health Status? Paper presented at the American Psychological Association Annual Convention, Washington, D.C., August, 2017.

Concussive effects/mild traumatic brain injury (mTBI) in veterans from the Iraq and Afghanistan conflict in relation to other physical and psychological health problems.

Thomas G. Urosevich, OD, MS, FAAO¹; Stuart N. Hoffman, DO¹; Richard E. Adams, PhD²; H. Lester Kirchner, PhD¹; Johanna C. Hyacinthe, MS¹; Charles R. Figley, PhD³; Joseph A. Boscarino, PhD, MPH¹.

¹Geisinger Clinic, ²Kent State University, ³Tulane University

Presented at: American Optometric Association Annual Meeting, Washington, DC, June, 2017.

Study Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND (USAMRMC), PRINCIPAL INVESTIGATOR: Joseph A. Boscarino, PhD, MPH, Psychological Health and Traumatic Brain Injury Research Program (PHTBIRP) - Community Partners in Mental Health Research, Award # W81XWH-15-1-0506

Contact: Thomas G. Urosevich, OD, MS, FAAO; The Eye Institute, Geisinger Health System, Danville, PA. (570)332-4675, tgurosevich@geisinger.edu.

SUMMARY

Background

Traumatic brain injury (TBI) and posttraumatic stress disorder (PTSD) are considered the signature injuries of the Iraq and Afghanistan conflicts. With the extensive use of Improvised Explosive Devices (IED) by the enemy, the concussive effects from blast contribute to cases of mild traumatic brain injuries (mTBIs) in the Veteran population. It is hypothesized that mTBI injuries can be associated with other physical and psychological health problems among veterans seen in clinical practice.

Methods

As part of a larger study involving veterans from other service eras, including those from the Vietnam and Gulf War conflicts, we surveyed 289 Veterans who had served in the Iraq and/or Afghanistan during those conflicts. Data for the study were collected using diagnostic interviews administered by telephone. All veterans surveyed were outpatients of the Geisinger Health System, a large, integrated health care organization in Pennsylvania, and one of largest integrated health services organizations in the United States involved in public health research. Health outcome measures were assessed for veterans who had a history of service-related concussion, compared to veterans who did not.

Results

Of the 289 Veterans surveyed, 95.0% were male, 62.2% were 18-44 years old, 93.4% were white race and 76.8% were National Guard/Reserve Veterans. Of those surveyed, 29.1% had a history of service related concussive effects/(mTBI. The majority of Veterans (53.6%) with presumed mTBI were classified as having high combat exposure and 60.7% had multiple warzone tours. Additionally, 50.03% had current TBI symptoms; 53.6% reported that pain interfered with their life within the last month; 21.4% met the diagnostic criteria for PTSD in the past year; 54.8% had used psychological services in the last year; 53.6% met criteria for having a current major mental disorder in the past year (PTSD, depression, alcohol dependence, or high global severity), and 46.4% with presumed mTBI reported fair or poor current health status.

Conclusion

A significant number of Veterans from the Iraq/Afghanistan era who had suffered concussive blast effects (mTBI) present with additional physical and psychological health problems in clinical practice. Based on multivariable logistic regression, high combat exposure is the best predictor of a history of mTBI (OR=4.5, $p<0.001$), followed by pain (OR=2.5, $p=0.004$) and having current mental health problems (OR=2.0, $p=0.029$). The primary eye care provider that encounters veterans as patients needs awareness of the health problems associated with mTBI. Additional research, including visual dysfunctions from mTBI and PTSD, is planned.

Post-Deployment Mental Health Status and Obesity among a Multi-generational Sample of U.S. Veterans

Johanna C. Hyacinthe, MS; Stuart N Hoffman, DO; ¹ Thomas G. Urosevich, OD, MS, FAAO; ¹ H. Lester Kirchner, PhD; ¹ Richard E. Adams, PhD; ² Charles R. Figley, PhD³; Joseph A. Boscarino, PhD, MPH^{1,1} Geisinger Clinic, ² Kent State University, ³ Tulane University

Presented at: 2017 Annual Healthcare Services Research Network Conference, San Diego, CA.

Study Objective: Since history of PTSD and depression have been associated with obesity in previous studies, the objective of the current study was to assess if these disorders were associated with obesity among formerly deployed U.S. veterans.

Methods: We surveyed a random sample of U.S. veterans who were patients in a large non-VA multi-hospital system located in Central and Northeastern Pennsylvania to assess their mental health, physical health, and obesity status. Obesity was defined as having a BMI > 30. Our hypothesis was that mental health status, including having PTSD or depression, was associated obesity.

Results: Of 1,289 veterans surveyed (response rate ~ 60%), 53.6% were from the Vietnam era, 95.0% were male, 54.5% were 65 years old or older, 95.7% were white race, and 26.9% were recent National Guard or Reserve service members. Altogether 44.3% (95% CI = 41-5-47.1) of veterans were classified as obese. Study variables associated with obesity included non-white race, not having a college degree, having a lower income, reporting lower unit support during deployment, currently using the VA system, having applied for or received VA disability, having ever used mental health services, currently using psychotropic medications, reporting poor/fair health status, and reporting pain in the past month (p-values < 0.05). Contrary to our hypothesis, neither having PTSD nor depression were associated with obesity among veterans in the current study. In multivariable analyses that adjusted for age, gender, education, combat exposure, life stressors, and social support, no association was for mental health status and obesity. The best predictors of current obesity among veterans was not having a college education (OR=0.53, p<.001) and reporting poor or fair health status (OR=1.51, p=.001).

Conclusion: These preliminary data do not support the link between mental health status and obesity among deployed U.S. veterans. Further research that examines obesity, and eating disorders, among formerly deployed veterans is planned.

Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND (USAMRMC), PRINCIPAL INVESTIGATOR: Joseph A. Boscarino, PhD, MPH, Award # W81XWH-15-1-0506.

**Alcohol Misuse among Formerly Deployed U.S. Service Members seen Non-VA Facilities:
Results from the Veterans' Cohort Study**

Joseph A. Boscarino, PhD, MPH;¹ Stuart N Hoffman, DO;¹ Thomas G. Urosevich, OD, MS, FAAO;¹
H. Lester Kirchner, PhD;¹ Johanna C. Hyacinthe, MS;¹ Richard E. Adams, PhD;² Charles R. Figley, PhD³
¹Geisinger Clinic, ²Kent State University, ³Tulane University

Presented at: 2017 Annual Healthcare Services Research Network Conference, San Diego, CA.

Study Objective: Since reports suggest that alcohol misuse is a health problem among U.S. military personnel, our objective was to assess the prevalence of alcohol-use disorders among formerly deployed service members seen Non-VA healthcare facilities. Because research also suggested higher alcohol abuse among Vietnam veterans, our hypothesis was that Vietnam veterans would have a higher prevalence of alcohol misuse than deployed veterans from the other service eras.

Methods: We surveyed a random sample of veterans who were patients in a large non-VA multi-hospital system located in Central and Northeastern Pennsylvania to assess their mental health and substance use. The study included veterans from four service eras: Vietnam, Gulf War, Global War on Terror, and other veterans.

Results: Of 1,289 veterans surveyed (response rate ~ 60%), 53.6 were from the Vietnam era, 95.0% were male, 54.5% were 65+ years old, 95.7% were white race, and 26.9% were recent National Guard or Reserve veterans. Based on the AUDIT-C and the CAGE instruments, the prevalence of alcohol misuse was 27.3% and 14.1%, respectively, compared to only 8.7% for current PTSD and 8.8% for current depression. Altogether, 25.8% reported using alcohol to cope post-deployment and 21.0% report heavy drinking in the past year. Bivariate analyses indicated that alcohol misuse was more common among those who were older, Vietnam veterans, higher income veterans, and those who had a history of cigarette smoking (p-values < 0.05). However, multivariable analyses (MVA) that adjusted for gender, education, combat exposure, life stressors, and social support, found no significant differences for alcohol misuse or abuse by the different veteran groups. The best predictors of current alcohol misuse in MVA was having used alcohol to cope post deployment (OR=2.99, p<0.001) and younger age (OR=0.97, p<0.001).

Conclusion: Our analyses suggest that while deployed Vietnam service members had a higher prevalence of alcohol misuse, when the data were adjusted for demographic factors and potential confounders, there were no significant differences between the veteran groups. Further research that examines the high prevalence of alcohol misuse among veterans and the adverse impact of using of alcohol to cope post deployment is planned.

Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND, PRINCIPAL INVESTIGATOR:
Joseph A. Boscarino, PhD, MPH, Award # W81XWH-15-1-0506.

**Risk and Protective Factors for Suicide among Formerly Deployed U.S. Service Members:
Results from the Veterans' Health Study**

Joseph A. Boscarino, PhD, MPH;¹ Stuart N Hoffman, DO;¹ Thomas G. Urosevich, OD, MS, FAAO;¹
H. Lester Kirchner, PhD;¹ Johanna C. Hyacinthe, MS;¹ Joseph J. Boscarino, BA;² Richard E. Adams, PhD;³
Charles R. Figley, PhD⁴

¹Geisinger Clinic, ²William James College, ³Kent State University, ⁴Tulane University

To be presented at: International Society of Traumatic Stress Studies, Chicago, IL, November 9, 2017.

Study Objective: Since reports have suggested that suicide is a serious problem among U.S. military personnel, our objective was to assess the risk and protective factors for suicidal behavior among formerly deployed service members. Currently, research indicates that suicide risk may be greater among recent veterans. In light of this, our study assessed suicide risks among veterans from different service eras, including the Vietnam War, Gulf War, and Global War on Terrorism veterans, as well as others.

Methods: We surveyed a random sample of ~1,700 veterans who were outpatients in the largest multi-hospital system located in Central and Northeastern Pennsylvania to investigate mental health and suicide risk status. All veterans served in one or more warzone deployments.

Results: Of the veterans surveyed (response rate ~ 60%), 55% were from the Vietnam era, 95.0% were male, their mean age was 59 years old, 96% were white race, and 24% were National Guard or Reserve veterans. Altogether, 24% of veterans had a history of high combat exposure. The prevalence of current PTSD among veterans was 7.7%, and the rate of current depression was 8.3%. The lifetime prevalence of suicidal thoughts was 11%, and 12% had seriously thought about suicide, developed a plan, or had attempted suicide. In multivariable logistic regression, the best predictors of suicidal thoughts were having a history of depression (OR=6.0, p<0.001) and receiving mental health treatments (OR=4.0, p<0.001). The best predictors of high risk for suicidality (i.e., seriously thought about, had a plan, or attempted suicide) were history of depression (OR=4.2, p<0.001), mental health treatment, and history of neglect/abuse (OR=2.1, p<0.001). Analyses also revealed that having positive personality traits, such as openness and agreeableness, were protective for suicide risks. Finally, after controlling for potential confounding variables, there was no difference in suicide risk for veterans from different service eras.

Conclusion: We found both risk and protective factors for suicidality among a large multi-generational cohort of deployed veterans. Our analyses suggest that there are common risk and protective factors for suicide risks among different generations of veterans. Contrary to some reports, our study revealed that combat exposure was not a risk factor for suicidality, but that a history of neglect/abuse was a predictor of suicide risk among veterans. Further research is planned.

Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND, PRINCIPAL INVESTIGATOR:
Joseph A. Boscarino, PhD, MPH, Award # W81XWH-15-1-0506.

**Female Military Veterans' Risk and Protective Factors in Predicting Overall Functioning:
A Biomedical Sample of Outpatients from Geisinger Clinic**

Charles Figley, Tulane University; Richard E. Adams; Kent State University
Thomas G. Urosevich, Geisinger Clinic; Stuart N. Hoffman; Geisinger Clinic
H. Lester Kirchner, Geisinger Clinic; Johanna C. Hyacinthe, Geisinger Clinic
Joseph J. Boscarino, William James College; Joseph A. Boscarino, Geisinger Clinic

To be presented at the International Society for Traumatic Stress Studies, Chicago, November 9, 2017.

Throughout US history servicewomen have been a valuable asset to the military mission, most notably in the fields of health and mental health care. Recently the USMC removed all barriers to women who wish to serve in combat. Although women comprise only 17 percent of active duty forces, they play a proportionately larger role in military health care than men. Female war veterans made up 5% (N=80) of our Department of Defense study sample of 1,580 war veterans from the Vietnam, Gulf War, Global War of Terrorism and other conflicts. All veterans studied were Geisinger outpatients and received both their health and mental health services through the Geisinger Health System, the largest multi-hospital organization located in Central and Northeastern Pennsylvania. Our findings suggest that, compared to men, women are younger (43 vs. 60 years old), more often not married (49% vs. 21%), more often college graduates (48% vs. 24%), less likely to have high combat exposures (3% vs. 25%), but more likely to have a history of lifetime PTSD (31% vs. 12%), a history of lifetime depression (48% vs. 21%), and have higher rates of mental health service use (69% vs. 47%). In a multivariate logistic regression that controlled for age, education, marital status, deployment history, and combat exposure, women had a 2.5 times greater risk for major depression (OR=2.5, $p=0.008$), and a 3 times greater risk for PTSD compared to men (OR=3.0, $p=0.006$). Female veterans were also twice as likely to have low psychological resilience (OR=2.2, $p=0.017$), but less likely to have a history of concussion (OR=0.4, $p=0.025$) and heavy drinking (OR=0.2, $p=0.035$). Thus, female veterans tend to be considerably different than male veterans, including being younger not married, and having a higher education level. Nevertheless, female veterans appear to be at greater risk for major depression and PTSD, post deployment. The final section of the paper discusses the importance of gender-specific training about and attention to the risk and protective factors identified in this study.

Funding for this research was provided by: Department of Defense (Contract No. W81XWH-15-1-0506) to Dr. Joseph A. Boscarino.

Mental Health Impact of Homecoming Experience among Deployed Veterans from the Vietnam War to Current Warzone Conflicts: Results from the Veterans' Health Study

Joseph A. Boscarino, PhD, MPH;¹ Stuart N Hoffman, DO;¹ Thomas G. Urosevich, OD, MS, FAAO;¹ H. Lester Kirchner, PhD;¹ Joseph J. Boscarino, BA;² Richard E. Adams, PhD;³ Carrie Withey, BSN, Ryan J. Dugan, MS;¹ Charles R. Figley, PhD⁴

¹Geisinger, ²William James College, ³Kent State University, ⁴Tulane University

To be presented at: The 2017 Annual Meeting of the International Society of Traumatic Stress Studies, November 9-11, 2017, Chicago, IL, USA.

Background: Currently there is interest in social factors associated with adverse outcomes among veterans.

Methods: We examined post-deployment homecoming support on health outcomes among a community-based sample of 1,730 veterans using telephone interviews.

Results: The mean age of veterans was 60 and 95% were male. Altogether, 56% served in Vietnam, 23% Iraq/Afghanistan, 16% Persian Gulf, and 14% served in other conflicts. Among veterans, the prevalence of PTSD was 7.6%, depression 8.3%, anxiety disorder 12.4%, alcohol misuse 24%, and suicidality was 12.4%. Overall, 26% of veterans were classified as having low homecoming support based on the Deployment Risk & Resilience Inventory, which was more common among Vietnam compared to other veterans (OR = 22.43, p=0.0001). In multivariable regressions controlling for demographics, combat exposure, deployments, trauma history, service era, and social support, low post-deployment support was associated with PTSD (OR=2.49, p=0.004) and suicidality (2.75, p=0.0001), but negatively associated with alcohol misuse (OR=0.65, p=0.014) and approached significance for anxiety disorders (OR=1.61, p=0.053).

Conclusions: Years after deployments, lower homecoming support for services members was associated with PTSD and suicidality, regardless of service era and warzone exposure, suggesting that the impact of the community support on veterans' health may be long-term.

Funding: U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND, PRINCIPAL INVESTIGATOR: Joseph A. Boscarino, PhD, MPH, Award # W81XWH-15-1-0506.

Correspondence: Joseph A. Boscarino, PhD, MPH, Professor, Department of Epidemiology & Health Services Research, Geisinger, 100 N. Academy Avenue, 44-00, Danville, PA 17822. Phone: 570-214-9622 E-mail: jaboscarino@geisinger.edu

Mental Health Disorders, Suicide Risk and Treatment seeking among Formerly Deployed National Guard and Reserve Service Member seen in Non-VA Facilities

Log Number: PT140183; Data analyses and study dissemination phase

Award Number: W81XWH-15-1-0506

PI: Joseph A. Boscarino, PhD, MPH

Org: Geisinger Clinic, Danville, PA

Award Amount: \$ 2,261,852



Study Aims

Aim 1: To estimate the prevalence of and risk factors for mental health disorders, substance use disorders, TBI, and suicide among National Guard and Reserves personnel who have returned from recent combat.

Aim 2: To identify protective factors for the onset and course of posttraumatic stress disorder (PTSD) and related disorders among service members after combat operations.

Aim 3: To assess the outcome of interventions received by National Guard and Reserves members during/after recent combat operations, including brief interventions.

Aim 4: To conduct genetic research related the risks for mental disorders, including the development of a DNA repository and research panel for future studies related to the genetics and consequences of PTSD and related disorders.

Method

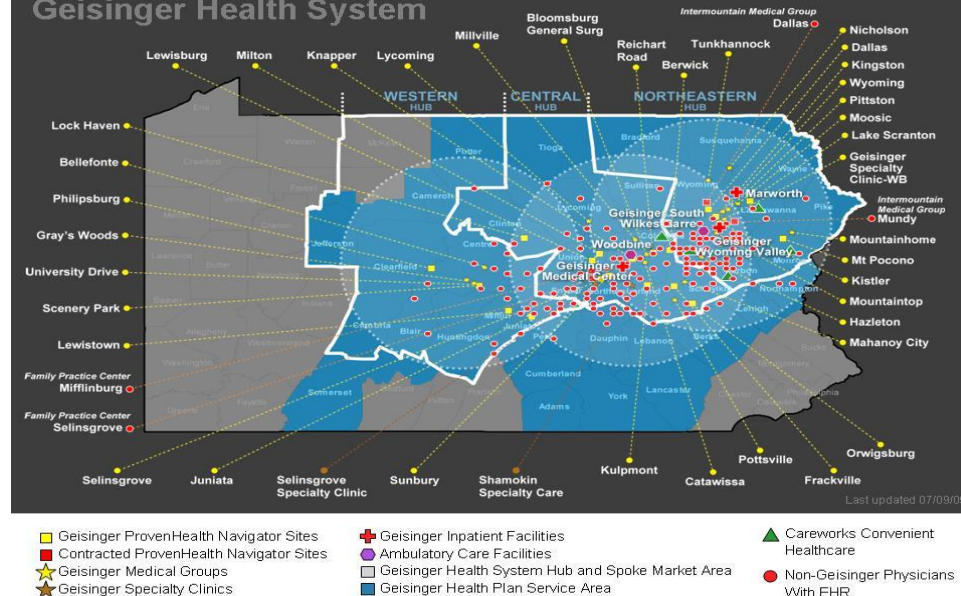
A cohort study that includes multivariable analyses of diagnostic interviews with 900 deployed National Guard/Reverse veterans and 900 deployed veterans from other service eras, plus longitudinal clinical data from electronic health record (EHR) and DNA samples from Geisinger Clinic veterans.

Timeline and Cost

Activities	CY	15	16	17	18
Setup, IRB, recruit, data collection					
Merge survey, EHR data, DNA					
Conduct data analyses					
Complete analyses & disseminate					
Estimated Budget (\$K)		\$857K	\$804K	\$601K	

Updated: 10-25-17 (JAB)

Geisinger Health System



Goals/Milestones

CY15 Goals – Study preparation, and set-up, IRB phase

- ☒ Hired 2 personnel key to study operation
- ☒ Conducted initial meeting, updated veteran registry, and revised phone survey
- ☒ Submitted protocol and supporting documents to Geisinger & DoD IRB and National Institute of Mental Health (NIMH) for Certificate of Confidentiality
- ☒ Received Geisinger/DoD IRB approval & Certificate of Confidentiality from NIMH

CY16 Goals – Recruit study subjects from Geisinger Clinic

- ☒ Using the veterans' registry, conducted data pull for veterans status and demographics
- ☒ Began survey interviewing and collection of DNA
- ☒ Conducted preliminary data analyses
- ☒ Prepared and submitted abstracts to professional meetings and began writing manuscripts
- ☒ Began genotyping of selected SNPs
- ☒ Presenting findings at regional & national conferences
- ☒ Extracted DNA & genotyped candidate genes for PTSD/addiction disorders, etc.
- ☒ Held local town hall meeting for ~100 veterans who participated in survey
- ☐ Complete extraction of relevant clinical data from EHR
- ☐ Merge & clean final dataset, complete analyses

CY17 Goals – Complete data analyses & disseminate results

- ☒ Begin submission of papers for publication to key medical journals

Comments/Challenges/Issues/Concerns

Delayed timeline due to ceding IRBs and having a survey time of >60 minutes

Had to increase recruitment efforts for National Guard/Reserve cohort to met study objectives

Budget Expenditure to Date

Projected Expenditure: \$ 1,227,902

Actual Expenditure: \$ 1,002,489